CHAPTER 9

NOISE

INTRODUCTION

The contents of a Noise Element and the methods used in its preparation are established by the requirements of California Government Code Section 65302 (f) and by the Guidelines for the Preparation and Content of Noise Elements of the General Plan, adopted and published by the California Office of Noise Control (ONC) in 1976. The ONC Guidelines require that certain major noise sources and areas containing noise sensitive land uses be identified and quantified by preparing generalized noise exposure contours for current and projected conditions within the community. Contours may be prepared in terms of either the Community Noise Equivalent Level (CNEL) or the Day-Night Average Level (L_{dn}), which are descriptors of total noise exposure at a given location for an annual average day. The noise exposure information developed for the Noise Element is intended to be incorporated into the general plan to serve as a basis for achieving land use compatibility within the community. It is also intended that noise exposure information be used to provide baseline levels and noise source identification for use in the development and enforcement of a local noise control ordinance.

EXISTING AND FUTURE NOISE ENVIRONMENT

Major Noise Sources

Based on discussions with the City of Point Arena staff regarding potential major noise sources and the results of field studies by Brown-Buntin Associates, it was determined that there is one potentially significant primary source of community noise within the City of Point Arena. This source is traffic on Highway 1 and on city streets. Local light industrial activities were also considered potential noise sources, subject to field evaluation. The roadways selected for study include:

Port Road,
Iverson Avenue,
Lake Street,
Riverside Drive,
State Highway 1.

A combination of noise monitoring and analytical noise modeling techniques was used to develop generalized L_{dn} noise contours for the roadways listed above for existing (1984) and future (2005) conditions (see Figure III-16). Because noise contours for existing (1984) and future (2005) noise conditions are so similar, only the future conditions are depicted on Figure III-16.

Analytical noise modeling techniques generally make use of source-specific data including average levels of activity, hours of operation, seasonal fluctuations, and average levels of noise from source operations. Analytical methods have been developed for a number

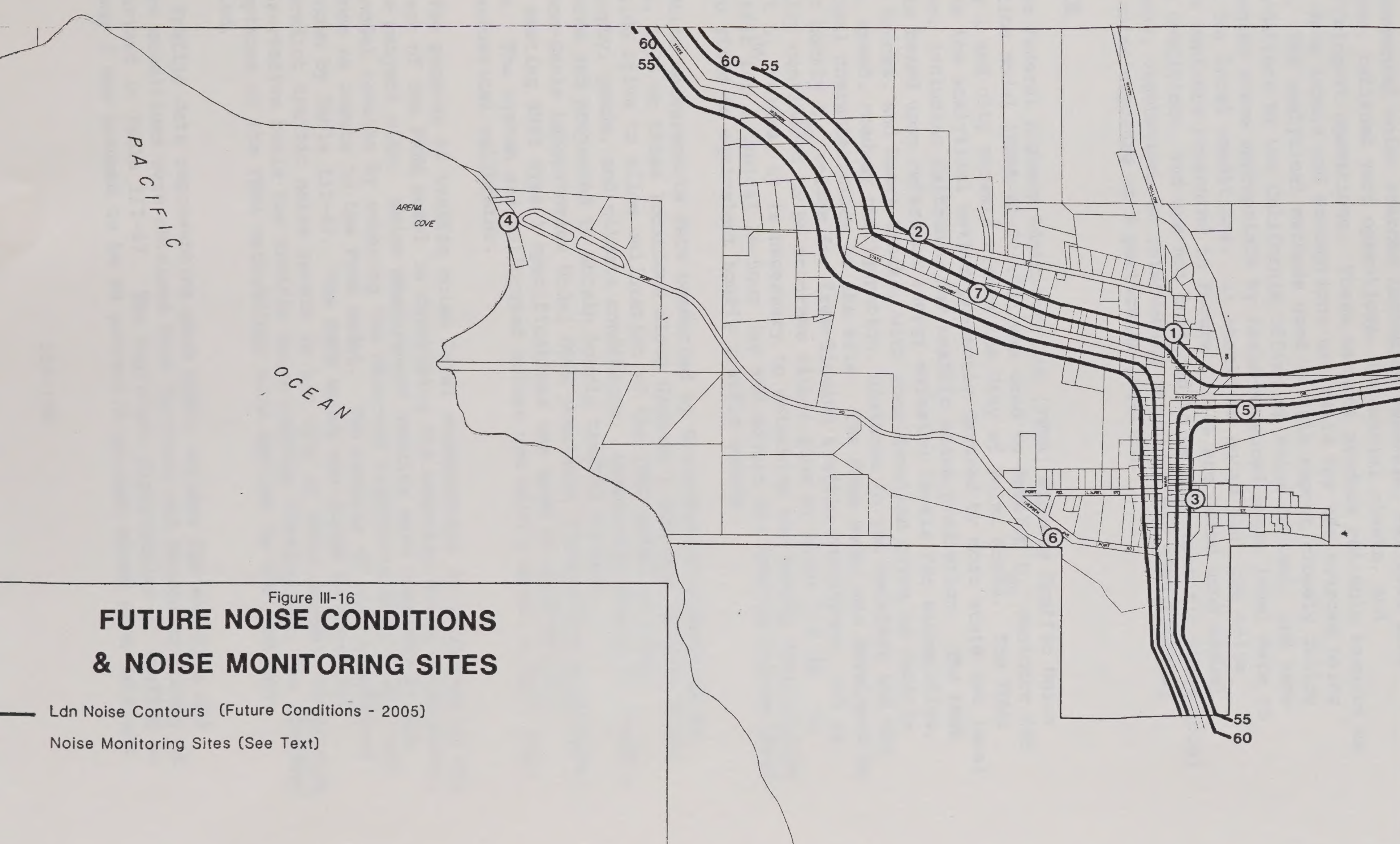


Figure III-16

FUTURE NOISE CONDITIONS & NOISE MONITORING SITES

Ldn Noise Contours (Future Conditions - 2005)

Noise Monitoring Sites (See Text)

of environmental noise sources including roadways, railroad line operations, railroad yard operations, industrial plants, and aircraft/airport operations. These methods produce reliable results as long as data inputs and assumptions are valid for the sources being studied. The analytical methods used in this report closely follow recommendations by the California Office of Noise Control, and were supplemented where appropriate by field-measured noise level data to account for local conditions. It should be noted that the noise exposure contours presented in Figure III-16 are based upon annual average conditions, and are not intended to be site-specific where local topography, vegetation, or intervening structure may significantly affect noise exposure at a particular location.

Roadways

The Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to develop L_{dn} contours for Highway 1 and city streets within the City of Point Arena. The FHWA Model is the analytical method presently favored by most state and local agencies, including Caltrans, for traffic noise prediction. The FHWA Model is based upon reference energy emission levels for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within plus or minus 1.5 dB. To predict L_{dn} values, it is necessary to determine the hourly distribution of traffic for a typical 24-hour day and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Noise measurements were conducted by Brown-Buntin Associates on June 6, 1985 at three locations along Highway 1 and one location along Riverside Drive to allow calibration of the FHWA model to local topography, grade, and climate conditions. Concurrent counts of traffic were made and projected to obtain hourly traffic volumes.
A Larson-Davis Laboratories Model 800B precision integrating sound level meter meeting ANSI Type 1 specifications was used to monitor noise levels. The system was calibrated before use with a Bruel & Kjaer Type 4230 acoustical calibrator.

The purpose of traffic noise level measurements is to determine the accuracy of the FHWA model in describing the existing noise environment at the project site. Noise measurement results were compared to the FHWA model results by entering the observed traffic volume, speed, and distance as inputs to the FHWA model. The results of this comparison are shown by Table III-47. The FHWA model was found to generally overpredict traffic noise levels in the City of Point Arena. To provide a conservative basis for traffic noise contour development, the standard assumptions of the FHWA methodology were applied to the roadways studied.

Traffic data representing peak month volumes for existing and future conditions were obtained from Caltrans and Mendocino County as summarized in Table III-47. The day/night distribution of traffic on Highway 1 was assumed to be 94 percent/6 percent based upon Caltrans

file data, and was assumed to be 88 percent/12 percent for city streets per Mendocino County data. Future projections of annual daily traffic volumes are based upon a yearly growth factor of five percent. Truck mix was determined from Caltrans and Brown-Buntin Associates data. Using data from Table III-47 and the FHWA methodology, traffic noise levels as defined by L_{dn} were calculated for existing (1984) and projected future (2005) traffic volumes. Distances from the center of the roadway to L_{dn} contour values of 60 and 55 dB are summarized in Table III-48. Highway noise contours predicted for the year 2005 have been plotted on Figure III-16 to illustrate traffic noise exposure along Highway 1 and Riverside Drive in the City of Point Arena. It should be noted that since calculations did not take into consideration shielding caused by local buildings or topographical features, the distances reported in Table III-48 should be considered as "worst-case" estimates of noise exposure along roadways in the community.

TABLE III-47

AVERAGE DAILY TRAFFIC DATA

Description	1984	2005
Port Road	400	800
Iverson Avenue	240	800
Lake Street	650	1,300
Riverside Drive	1,100	2,700
Highway 1:		
South of City limits	1,700	3,400
Riverside Drive	3,300	6,600
Lake Street	2,600	5,200
North City Limits	2,100	4,200

Sources: Caltrans, County of Mendocino, Brown-Buntin Associates

TABLE III-48

DISTANCE (FEET) FROM CENTER OF ROADWAY TO L_{dn} CONTOURS

Description	1984 60 dB	1984 55 dB	2005 60 dB	2005 55 dB
Port Road	7	15	11	23
Iverson Avenue	5	10	11	23
Lake Street	9	20	15	32
Riverside Drive	46	100	73	158
Highway 1:				
South City limits	36	78	57	124
Riverside Drive	56	121	89	192
Lake Street	72	155	114	246
North City limits	63	135	99	214

Source: Brown-Buntin Associates

Industrial Facilities

There are no noise-significant industrial facilities currently operating in the City of Point Arena. Field investigation revealed the following operations, although light industrial in nature, involved no noise-significant activities at this time:

Whitney Burl Shop - Highway 1
Redwood "Twirlies" Shop - Highway 1
Chevron fuel depot - Port Road (Wharf area)
PG&E storage yard - Windy Hollow Road

Development plans for the wharf area include removal of the fuel storage tanks, so that this operation is not expected to have any future noise impact. Future activities at the burl shop and "twirlies" shop are unknown, but they could be relocated in the industrial area proposed as part of an annexation now being considered by the City.

NOISE SENSITIVE AREAS

The following noise sensitive land uses have been identified within the City of Point Arena:

1. All single and multi-family residential uses
2. The elementary and high schools
3. Point Arena Medical Center

As required by the State law and ONC Guidelines, a community noise survey was conducted to document noise exposure in areas of the community containing noise sensitive land uses. Noise monitoring sites were selected to be representative of typical conditions in areas of the community where such uses are located. Short-term noise monitoring was conducted on June 5 and 6, 1985, during three periods of the day and night so that reasonable estimates of L_{dn} could be prepared. (See Appendix 9-B for typical short-term noise measurement results.)

A long-term noise monitoring site was established in the back yard at 230 Highway 1, where noise measurements included hourly computation of L_{eq} and other statistical data, collected from 4:00 p.m. June 6 to 11:00 a.m. June 8, 1985.

Community noise monitoring equipment consisted of a Larson-Davis Laboratories Model 800B precision integrating sound level meter fitted with an ACO Type 7012 1/2" microphone, and a Larson-Davis Laboratories Model 700 environmental noise analyzer. The measurement systems were calibrated in the field prior to use with acoustical calibrators, and comply with all applicable requirements of the American National Standards Institute (ANSI) for Type I (Precision) or Type II (General Purpose) sound level meters. Noise monitoring sites, measured noise levels and estimated L_{dn} values are summarized in Table III-49. The noise monitoring sites are also shown in Figure III-16.

TABLE III-49

SUMMARY OF MEASURED NOISE LEVELS AND ESTIMATED DAY-NIGHT AVERAGE LEVELS (L_{dn}) IN AREAS CONTAINING NOISE SENSITIVE LAND USES

Site #	Description	Level (decibels) L_d	L_n	L_{dn}
1	Elementary School, Main St.	54	26	50-55
2	High School, Lake Street	48	30	40-50
3	Medical Center, Mill Street	52	36	50-55
4	Wharf area (100' above high tide)	55	54	60-65
5	Assembly of God Church, Riverside Drive	57	31	50-55
6	Iverson Road b/w Port St. & Hwy. 1	43	34	40-45
5*	230 Highway 1	52.6	43.6	53.0

*long-term monitoring site

$L_d = L_{eq}$ during daytime hours (7:00 a.m. to 10:00 p.m.)

$L_n = L_{eq}$ during nighttime hours (10:00 p.m. to 7:00 a.m.)

Source: Brown-Buntin Associates

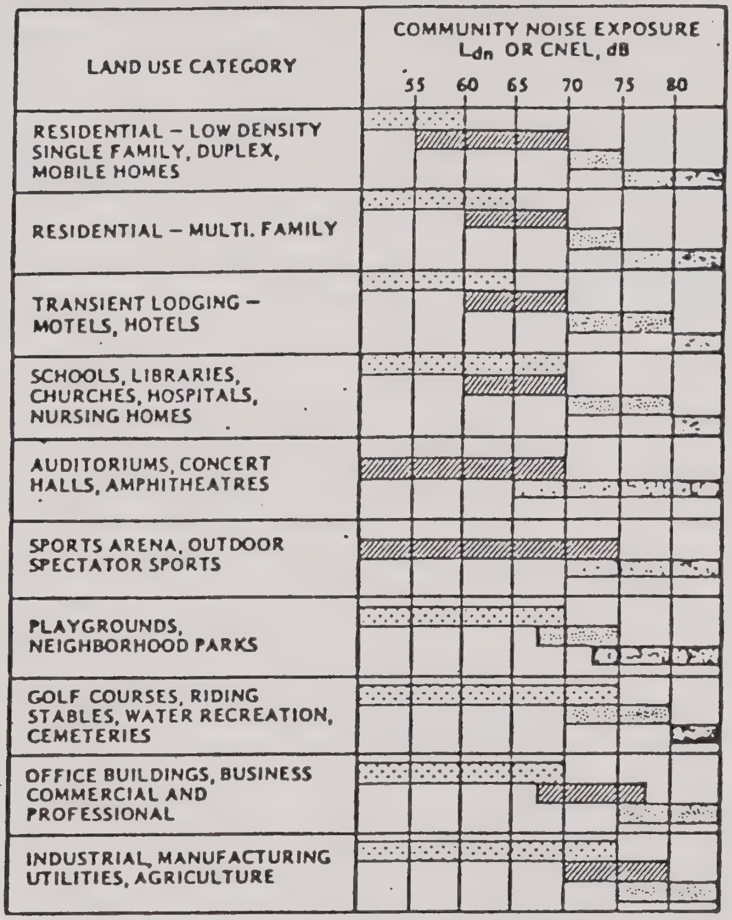
The noise monitoring program indicated that the noise environment in the City of Point Arena is very quiet, except along Highway 1 where noise from heavy trucks is significant. The only other notable source of noise is the sound made by people congregating at night along Highway 1 (Main Street), where most of the City's restaurants and bars are located, along with the theatre. Noise from jukeboxes may also be heard as bar doors are opened. In many other communities, such noise sources would not be significant, but they are noticeable in Point Arena primarily because the nighttime background noise level is quite low.

Noise contours shown by Figure III-16 are intended to illustrate the general location and extent of noise levels exceeding 60 dB L_{dn} for projected future conditions within the community. Such contours are "worst-case" estimates of noise exposure in the community since they do not take into consideration local shielding from intervening buildings, vegetation, or topography. It is intended that these contours be used by the City of Point Arena as a guide in the planning of future land uses and zoning, and as a screening tool for evaluating development proposals involving noise sensitive land uses.

Figure III-17 is provided as a guide concerning the sensitivity of different land uses to their noise environment. It is intended to illustrate the range of noise levels which will allow the full range of

Figure III-17

Land Use Compatibility For Community Noise Environments



INTERPRETATION

NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE

New construction or development should generally not be undertaken.

CONSIDERATIONS IN DETERMINATION OF NOISE–COMPATIBLE LAND USE

A. NORMALIZED NOISE EXPOSURE INFORMATION DESIRED

Where sufficient data exists, evaluate land use suitability with respect to a "normalized" value of CNEL or L_{dn}. Normalized values are obtained by adding or subtracting the constants described in Table 1 to the measured or calculated value of CNEL or L_{dn}.

B. NOISE SOURCE CHARACTERISTICS

The land use-noise compatibility recommendations should be viewed in relation to the specific source of the noise. For example, aircraft and railroad noise is normally made up of higher single noise events than auto traffic but occurs less frequently. Therefore, different sources yielding the same composite noise exposure do not necessarily create the same noise environment. The State Aeronautics Act uses 65 dB CNEL as the criterion which airports must eventually meet to protect existing residential communities from unacceptable exposure to aircraft noise. In order to facilitate the purposes of the Act, one of which is to encourage land uses compatible with the 65 dB CNEL criterion wherever possible, and in order to facilitate the ability of airports to comply with the Act, residential uses located in Community Noise Exposure Areas greater than 65 dB should be discouraged and considered located within normally unacceptable areas.

C. SUITABLE INTERIOR ENVIRONMENTS

One objective of locating residential units relative to a known noise source is to maintain a suitable interior noise environment at no greater than 45 dB CNEL of L_{dn}. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to a noise source.

D. ACCEPTABLE OUTDOOR ENVIRONMENTS

Another consideration, which in some communities is an overriding factor, is the desire for an acceptable outdoor noise environment. When this is the case, more restrictive standards for land use compatibility, typically below the maximum considered "normally acceptable" for that land use category, may be appropriate.

Source: California Office of Noise Control

BBA

activities normally associated with a given land use. For example, exterior noise levels in the range of 50-60 dB L_{dn} are generally considered acceptable for residential land uses, since these levels will usually allow normal outdoor and indoor activities such as sleep and communication to occur without interruption. Industrial facilities, however, are relatively insensitive to noise and may be located in a noise environment of up to 75 dB L_{dn} without significant adverse effects.

References:

California Office of Noise Control, Guidelines for the Preparation and Content of Noise Elements of the General Plan, February 1976

California Office of Noise Control, Model Community Noise Control Ordinance, April 1977

Federal Interagency Committee on Urban Noise, Guidelines for Considering Noise in Land Use Planning and Control, June 1980

U. S. Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Safety with an Adequate Margin of Safety, EPA 550/9-74-004, March 1974

U. S. Environmental Protection Agency, Model Community Noise Control Ordinance, EPA 550/9-76-003, September 1975

APPENDIX 9-A

Noise and its Effects on People

Noise is often defined simply as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon. Researchers for many years have grappled with the problem of translating objective measurements of sound into directly correlatable measures of public reaction to noise. The descriptors of community noise in current use are the results of these efforts, and represent simplified, practical measurement tools to gauge community response. Before elaborating on these descriptors, it is useful to first discuss some fundamental concepts of sound.

Sound is defined as any pressure variation in air that the human ear an detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and hence are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, now called Hertz (HZ) by international agreement.

The speed of sound in air is approximately 770 miles per hour, or 1,130 feet/second. Knowing the speed and frequency of a sound, one may calculate its wavelength, the physical distance in air from one compression of the atmosphere to the next. An understanding of wavelength is useful in evaluating the effectiveness of physical noise control devices such as mufflers or barriers, which depend upon either absorbing or blocking sound waves to reduce sound levels.

To measure sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold as a point of reference, defined as 0dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range.

Use of the decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) are uniform throughout the scale, corresponding closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, in the range of usual environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighting the frequency response of a sound level measurement device (called a sound level meter) by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. In terms of community response, it is generally valid that a change in noise level of at least 5 dBA is required before any noticeable change in community response would be expected. A 10 dBA increase in noise level is perceived as being subjectively a doubling in loudness, which

would likely result in an adverse public reaction. Typical A-weighted sound levels generated by noise sources commonly found in the community are illustrated in Figure III-18.

It is common to describe community noise in terms of the "ambient" noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq} is the foundation of the composite noise descriptors such as L_{dn} and CNEL, and shows very good correlation with community response to noise.

Two composite noise descriptors are in common use today: L_{dn} and CNEL. The L_{dn} (day-night average level) is based upon the average hourly L_{eq} over a 24-hour day, with a +10 decibel weighting applied to nighttime (10:00 p.m. to 7:00 a.m.) L_{eq}'s. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were subjectively twice as loud as daytime exposures. The CNEL (Community Noise Equivalent Level), like L_{dn}, is also based upon the weighted-average hourly L_{eq} over a 24-hour day, except that an additional +5 decibel penalty is applied to evening (7:00 p.m. to 10:00 p.m.) hourly L_{eq}'s. The CNEL was developed for the California Airport Noise Regulations, and is applied specifically to airport/aircraft noise assessment. The L_{dn} scale is a simplification of the CNEL concept, but the two will usually agree, for a given situation, within 1dB. Like the L_{eq}, these descriptors are also averages and tend to disguise variations in the noise environment. Furthermore, because they presume increased evening or nighttime sensitivity, they are best applied as criteria for land uses where nighttime noise exposures are critical to the acceptability of the noise environment, such as residential developments.

Noise in the community has often been cited as being a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from the interference with human activities such as sleep, speech, recreation, and tasks demanding concentration or coordination. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases, and the acceptability of the environment for people decreases. This decrease in acceptability and the threat to public well-being is the basis for land use planning policies directed towards the prevention of exposure to excessive community noise levels.